



# Mild Traumatic Brain Injury

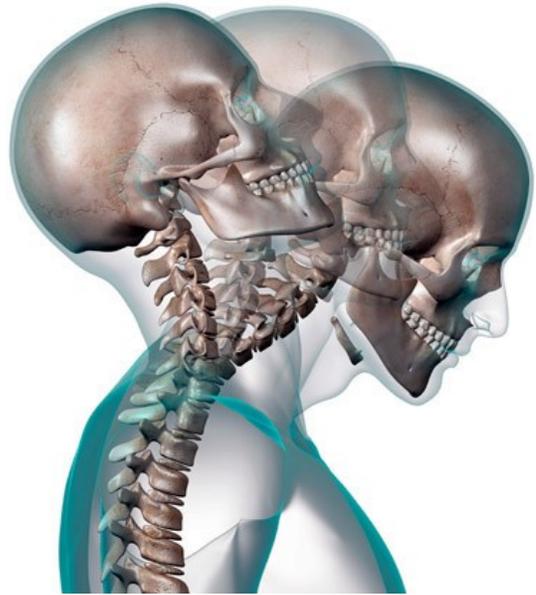
## Mechanism of Injury - Part Three

A Mild Traumatic Brain Injury (MTBI) or concussion can occur any time the brain impacts upon the skull. The nature of impact is determined by a varying degree of external forces such as blows to the head, a sudden stop, bouncing up and down or repeated impact. The most commonly thought of MTBIs are motor vehicle accidents, however there are several ways to create a concussion. The following material discusses both the causes and impact of concussion beyond the physical damage. Psychological issues, social issues and family issues are affected far beyond what is expected. The cost to society is tremendous.

## Mild Traumatic Brain Injury: Causes

### Flexion/Extension Force

One of the most widely recognized causes of concussion is a motor vehicle accident (MVA). A severe flexion/extension (whiplash) occurs, in which the brain is propelled forward and backward striking the front and back of the skull. This is a coupe contra/coupe injury (see right). During a MVA, the vehicle stops suddenly, the body continues to move forward until restrained by the safety belt. The head continues forward until restrained by the neck. The brain continues to move forward until it hits the skull. If the head is positioned forward, the brain hits the sinus cavities creating microscopic tears in the front sections of the brain (pre-frontal cortex). It then bounces backwards striking the back, inside of the skull (occipital cortex). This will create diffuse bruising as the skull is smooth and curved at the back.



### Rotational Flexion/Extension Force

Rotational flexion/extension injury is one in which the head is not only subjected to flexion/extension forces but rotational forces resulting rotation to the left, right or both. Thus the brain not only hits the front and back of the skull but can impact the sides as well. The sides of the brain (temporal lobes, frontal cortex, and parietal cortex) can be injured in addition to the front/back. This occurs commonly in impact from the side as seen primarily in contact sports or direct blows (i.e., by a fist).

### Vibration / Slip and Fall



Severe vibration is rare in the general population but seen in certain athletes (i.e. Luge or skeleton racers) and various occupations. It is believed that the constant vibration of the head being forced up and down produces microscopic tears in the brain which cumulate over time.

Forces to the tailbone from a slip and fall are transmitted up the spine, impacting the brain and driving it into the top of the skull. Often this type of accident does not result in immediate MTBI symptoms, but symptoms of dementia and Parkinson like tremors may manifest a few years later.

If headaches are reported as a post-concussive symptom, whiplash must be considered as a contributory cause. MTBI by its definition implies a sudden stop or change in direction involving the head and consequently the neck. A sudden stop/change in direction causes strains or sprains of the muscle, and disturbances in how the muscles work together. Unless treated these muscles develop what are known as “trigger points” that cause pain. Several muscles in the neck refer pain directly into the head. It is also important to consider the status of the cervical neck vertebrae if the headaches continue.

## Whiplash



## CoMorbid Factors

In medicine, the term "comorbid" refers to medical condition(s) existing simultaneously but independently with another condition; or can indicate a related medical condition or conditions (Wikipedia). These effects are seen in both physical and psychological issues. Physically, brain injury can change the complex internal functions of the body, such as regulating body temperature; blood pressure; bowel and bladder control. (Brain Injury Association of America)



Post concussion syndrome contains many features seen in psychological conditions. For example the reported symptoms of ADD are very similar to that of MTBI. Other psychological factors such as depression, anxiety, and social issues may also worsen due to MTBI. The reasons or mechanisms involved in this phenomena are not presently understood, and family relationships often become strained and dysfunctional. Research indicates that without intervention 90% of persons injured in a motor vehicle accident are divorced within 5 years. Research also indicates that 45% of the homeless have suffered concussions. Before the MTBI occurred 87% of the homeless owned their own homes.